MOVEMENT AND DISPLACEMENT IN THE RICE RAT

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Little has been added to the knowledge of certain aspects of the biology of the rice rat (*Oryzomys palustris*) since Hamilton (1946) reviewed the published data and commented on its paucity. Negus *et. al.* (1961) have conducted the most intensive field study on *Oryzomys,* focusing their attention on the ecology and population dynamics. Prior to Negus's work, patterns of movements appear to have been the least studied aspect of the biology of *Oryzomys.* Svihla (1931) marked and liberated two males; one individual was retaken 50 feet away the next day. None of four animals marked by Erickson (1949) was retaken. Pournelle (1950) reported 6 of 19 animals retaken, one immature animal traveling 270 feet and another a minimum of 222 feet overnight. Harris (1952) listed maximum recapture distances averaging 245 feet for six rice rats. The home range of 23 males averaged 0.81 acres, 12 females 0.51 acres (Negus, *et al.,* 1961). They recorded maximum movements of 1000 and 2000 feet for two adult males.

Materials and Methods

From late November 1959 to October 1960 I live trapped in a marshy grassland near Gainesville, Florida, to obtain information on the population structure, movements, and home ranges of the rice rat and to measure possible interactions between this species and the cotton rat (*Sigmodon hispidus*) which occupied the same area.

The gridded area, 600 by 800 feet in size, provided a naturally delimited piece of moist pasture land that was surrounded on three sides by marsh. It was trapped four days each month with Sherman traps 3 by 3 by 12 inches in size. Traps were located in rows 50 feet apart parallel to the shorelines and 100 feet apart in the rows perpendicular to the shoreline. Captured animals were sexed, examined to determine molt and other physical characters, and toe-clipped. They were weighed each time captured beginning in January.

Description of Study Area

The area studied consisted of marshy pasture on the periphery of Paynes Prairie, a large prairie located six miles south of Gainesville. The topography is nearly flat, and the demarcation between

land and water tenuous. Pasture grasses (mostly *Andropogon* spp.), an assortment of sedges (*Carex* spp.) and rushes (*Juncus* spp.), and various annual weeds composed the principal vegetation on the drier ground. Beds of *Panicum hemitomon, Hydrotrida caroliniana, Pontederia lanceolata,* and the sedges and rushes developed along the edge of the ponds and provided dense cover which the rice rats preferred. The larger clumps furnished elevated platforms where most nests and feeding platforms were built.

Habitat conditions changed during part of the study period. When the study began in November 1959, most of the gridded area could be trapped. The water level remained fairly stable until mid-March, when it rose briefly. It then dropped gradually during the spring. The entire area could be trapped during the summer until late August when heavy rains flooded nearly the entire plot. However, heavy grazing by cattle reduced the cover in the summer, and the rice rats shifted their activities to the emergent vegetation in the adjacent marshes. The stable water conditions during the first part of the study provided an opportunity to study habitat associations and preferences.

Populations

Unmarked rice rats were taken on the last day of trapping in only one month, hence most probably were trapped in four nights. Of 39 animals captured, 23 (59 per cent) were males and 16 (41 per cent) were females. Individuals were considered as adult after the post-juvenile molt was completed (usually between 30 and 40 grams). External examination, along with necropsy of collected specimens, indicated that most males were fertile at this time. All females in this category were infertile. Hamilton (1946) declared that young rice rats are half-grown at 40 grams. On the above criteria, young animals made up one-fourth of the population during the winter months. Of the adult animals present, 75 per cent of the males and 25 per cent of the females were in breeding condition.

Weights indicated that young animals predominated in this population. The average weight of ten males was 46.2 grams (range 32 to 70 grams); that of six females was 41.3 grams (range 30 to 50 grams). No rice rats weighing less than 30 grams were taken. I assume that the young begin to wander from the nest about this time and are then available to trap.

Movements

The validity of movement activity calculated from recapture data has often been discussed and evaluated. Brant (1962) concluded that traps spaced 50 and 100 feet apart intercept an animal's movements too infrequently in some cases to give a true measure of their activity. The trapping on Paynes Prairie indicated that the movements of rice rats were restricted, and hence the above criticism may apply here. In one sense the more widely spaced traps may actually be of advantage. Small mammals may become trap-prone and enter the same trap repeatedly. Several rice rats were taken in the same trap on consecutive nights, a behavior shown in many live-trapping studies. A high proportion of this type of activity would give an impression of restricted movement, just as widely spaced traps would be more likely to intercept and measure movements of the wide ranging individuals in a population. However, the home range values calculated below may best be used from a comparative standpoint, since the trap spacing in this study has been used commonly in other studies.

Thirty-nine animals were trapped a total of 107 times. Since many animals moved mainly along the shore lines, their recaptures, when plotted, showed more of a linear distance than a two-dimensional area. In these cases the distances between consecutive captures may give a more realistic measure of the habitat used and are shown in Table 1. Recaptures are shown according to the time elapsed since the last capture, those listed in the column titled 1-day being trapped on successive days, those in the 2-day column two days apart. Animals retaken the following months are listed in the 30-day column, and those two months later in the 60-day column.

Most average distances between consecutive recaptures increased with time (Table 1), but the maximum distances between captures at the 1 and 2-day intervals did not. The recaptures within one trapping period (1 and 2 days) should reflect wandering from a single homesite; hence the difference between the 1 and 2-day intervals may indicate that the rice rats vary their travel patterns from night to night and use different parts of the home range on different nights. However, the number of 2-day intervals is small.

TABLE 1

Distances between consecutive captures of *Oryzomys palustris* *

	1 day	2 days	30 days	60 days
Number of Recaptures	35	6	18	1
Average distance in feet between consecutive captures	95	139	220	60
Range	0–450	0–300	20–550	

* Paynes Prairie, Florida, January to September 1960.

The distance between consecutive recaptures from one trapping period to another could more conceivably result from a shift in home range or activity. This may account for some additional increase in the 30-day period. However, some rats moved as much as 450 feet in one night, a distance that approaches the intervals moved in one month.

Home ranges were calculated by the inclusive boundary method, in using from 3 to 10 recaptures in a 4-day to a 5-month period while water levels were fairly static. The ranges of nine individuals averaged 0.62 acres (extremes 0.12 to 1.80 acres). The average home range of females was slightly higher than that of males (0.72 to 0.56 acres), but the sample is small. Home ranges did not increase greatly in size when calculated from data obtained from longer periods of time, and this may indicate that the size shown here represents a single home range. Also, had water levels fluctuated greatly the animals would have been forced to shift home sites, thus biasing home range values.

Interspecific Relationships

Rice rats are found in dry fields to an elevation of 1000 feet or more (Hamilton, 1946) but are more characteristic of wet regions. In the Gainesville area they are common along marsh and lake borders and on Paynes Prairie are most abundant in the grassy vegetation surrounding the ponds and sloughs. They sometimes use the abandoned houses of *Neofiber alleni,* often some distance from land and in water up to 24 inches deep. In most habitats, however, rice rats are closely associated with the cotton rat. Hamilton (1946) noted this association, and Svihla (1931) also com-

mented on it. The respective habitats of the two species overlap considerably.

Eighty-seven per cent of the *Oryzomys* and 53 per cent of the *Sigmodon* captured during the study were from stations within 100 feet of the pond or marsh margins. However, the relative abundance of the two species at these stations changed between trapping periods. In November, when the study area was trapped for the first time, the borders were dry, although inundated earlier in the fall. During this month nine rice rats were taken here, while no *Sigmodon* were captured. In January five rice rats were taken, all in the same habitat as in November. Also, six cotton rats were captured, three of them in the marshy border. With respect to the capture sites, the two species were now sharing a common habitat to a high degree. In February, four *Oryzomys* were captured, all from the wet border. Six cotton rats were taken, three in the drier center portion of the study area and three from the same habitat as the rice rats. In March, of 19 rice rats taken, 16 came from the wet margins. Five of 7 cotton rats were trapped here. Water levels were slightly higher, but substantially the same habitat existed. Thus, to this time, the border zones were moist and contained dense grassy cover, and the percentage of *Sigmodon* in the catch increased each month.

In mid-March, heavy rains raised water levels so that two to three inches of water stood in the border zone. Trapping in early April indicated a decided change in the relationships of the two rodent species. Nineteen *Oryzomys,* 15 from the border strip, were taken 30 times in this trapping period, and no *Sigmodon* were taken. Had water levels been receding prior to this rise, one might suspect that the resulting drier substrate had become increasingly favorable for cotton rats, which were moving into this suitable habitat as it developed. However, water conditions from November to March were static, and in this period cotton rats became more numerous than rice rats.

The evidence is too scant to indicate whether the shift in the catch is a result of withdrawal or avoidance tendencies on the part of *Oryzomys* and whether overt friction existed. The shift may result from the seemingly greater tendency for *Sigmodon* to explore and establish new territories. This tendency may also partially account for the species' wide habitat tolerance. Within five days after rising water levels produced scattered pools of water, rice rats

again were most abundant in the border zone, and the cotton rats disappeared. The population of rice rats presumably had not declined during these months since more were taken in March and April than in the preceding months.

Summary

Movements and interspecific relationships of *Oryzomys* were studied from November 1959 to October 1960 in marshy grassland near Gainesville, Florida. The home ranges of 12 individuals averaged 0.62 acres (range, 0.12 to 1.80 acres). The average distance between consecutive captures was 95 feet in one day, 139 feet in two days, and 220 feet after 30 days. When moisture conditions remained static, the number of *Sigmodon* taken in the marshy border zone gradually increased in comparison with the number of *Oryzomys* trapped. This increase may indicate a greater predilection to explore and colonize new territories by *Sigmodon.*

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